DOCUMENT RESUME

ED 230 364 SE 041 556

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TITLE Trade-offs in Our Energy Future.
PUB DATE May 83
NOTE 12p.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Coal; *Cost Effectiveness; Costs; *Energy; Environmental Education; *Fuels; Futures (of Society); *Learning Activities; Nuclear Energy; Secondary Education
IDENTIFIERS *Energy Education

ABSTRACT

The purpose of this activity is to make students aware that there is no free energy source for the present or the future and that all technologies are potential threats to the environment. The activity consists of a short reading (discussing basic trade-offs, issues, and decisions related to petroleum, coal, and nuclear energy sources) and student exercises. Objectives and instructional strategies are provided for these exercises in which students research and evaluate environmental, societal, and monetary costs of energy sources. The key for students as decision makers is to pick the energy source least likely to be permanently harmful or the one that has the smallest total effect. (JN)

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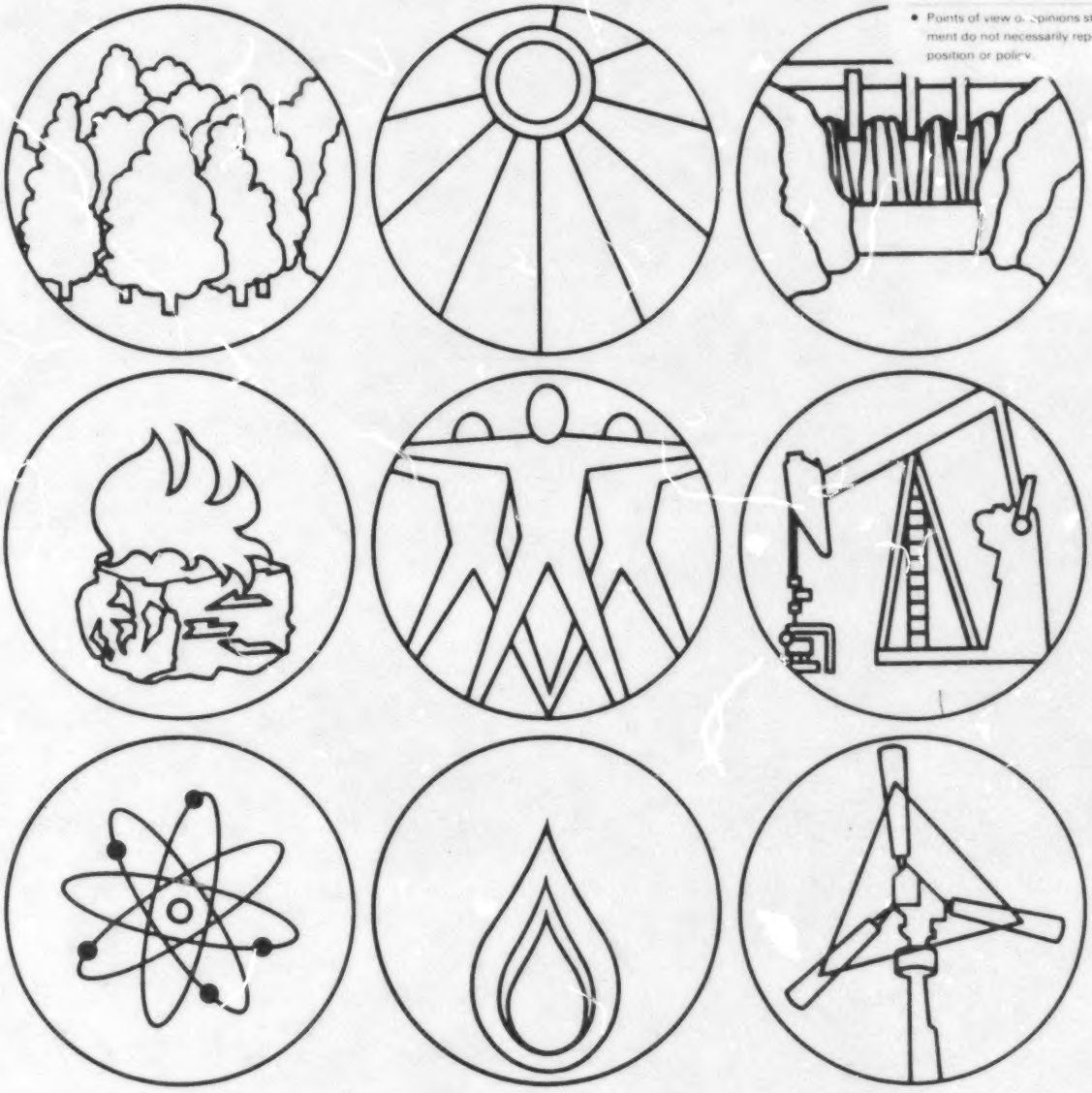

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Trade-offs in

Our Energy Future:

By: Dr. Stephen L. Canipe

MAY, 1983

TO THE TEACHER:

This learning activity concerning Energy Trade-offs is designed to make students aware that there is no free energy souce for the present or the future. What the students must realize is that all technologies are potential threats to the environment. The key for them as decision makers is to pick the one least likely to be permanently harmful or the one that has the smallest total effect. Any number of ideas can come into play while conducting this activity. It would be helpful for the teacher to assume the role of "devil's advocate" to encourage critical thinking on the part of the students.

This activity was developed as part of a larger package produced by the Duke Power Company and entitled SOURCES AND CHOICES. Teachers in the Duke Power Service territory can obtain the material from their local Duke office.

Stephen L. Canipe, Ed.D.
15 May 1983
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Social Studies

Energy Trade-Offs And Decisions

I. What are some of the BASIC trade-offs, issues, and decisions involved with use of our major energy sources?

Every energy source brings with its use certain trade-offs and decisions. Some of the basic trade-offs and decisions we face with our major energy sources are:

Petroleum: need for a standby or permanent government rationing policy in the event of a gas shortage; decision regarding the regulation of prices charged for gasoline and the amount of tax to be levied on petroleum companies; decisions regarding the quantity of petroleum we will import from other nations; priority allocation of heating oil and distribution of heating oil to those states most in need of it during winter months; priority use of gas during a shortage (that is, will petroleum be distributed primarily to individual users, or will it be reserved for use by the plastics and petrochemical industries?); decisions regarding automobile emission standards that might increase gasoline consumption.

Coal: strip-mining vs. environmental concerns; permissible emission levels for industries that burn coal; other uses of coal, such as gassification or liquefaction, which increase the rate at which we consume our coal reserves.

Nuclear energy: there is a need for a solution to the disposal of nuclear wastes; resolution of the question whether or not to build breeder reactors; finalization of safety standards for nuclear power plants; decision on whether or not to speed up the licensing process for nuclear plants; accurate measurement of the public attitude toward nuclear energy.

The above are only a few of the issues, trade-offs, and decisions associated with three of our major energy sources. We face also the dilemma that each of the items above can be approached from many different angles with facts and figures to support each argument. In addition, many public and private interest groups and concerned industries maintain powerful lobbies in Washington which affect the positions the government takes on these issues, trade-offs, and decisions.

Activity: Trade-Offs: Cost/Benefit Analysis

Students research and evaluate environmental, societal, and monetary costs of energy sources.

Objectives:

Student will be able to:

- name energy sources currently available
- summarize ways energy is important to our society
- list end-uses of fuels
- identify advantages and liabilities of various energy sources
- recognize that no energy source meets all criteria for ideal fuel
- discuss ways values influence evaluation of fuels

Directions:

1. List energy sources available to us.
2. Divide the class into groups to collect information on each fuel. Groups summarize research including:

   a. Is technology presently available for use?
   b. How can the fuel be used? e.g. transportation? industry?
   c. How expensive is it?
   d. How much is there?
   e. What are environmental costs? Can hazards be controlled? What are environmental benefits?
   f. What are the political costs/benefits?
   g. What are social costs/benefits?
   h. Are there differing opinions on the "facts" for the fuel? How did group decide which source of information to accept?

3. Summarize facts using Table I.
4. Compare energy sources using Table II.

   A scale of 1-10 is suggested for this comparison with 10 representing the best case.

5. Evaluate sources. Table III.

   A weighting scale of 1-5 is suggested. Class may decide that more than one criteria is worth 5 points.
   Once all sources have been compared, introduce a weighting factor to rank fuels. Deciding which criteria are most important will probably precipitate a discussion of values and some frustration. It is important that a concensus be reached.

TABLE I.

SUMMARY

Fuel	Available at present	End-Uses	$ Cost	Years Supply	Environmental Costs/ Benefits	Political Costs/ Benefits	Social Costs/ Benefits
Ideal	X	Transportation;	none	infinite	No pollution;	No politi-	Provides
		Agriculture;			Clean; safe	cal oppo-	jobs;
		Industry;				nents;	
		Electricity;				Balanced	
		Heating				national	
						interest	

TABLE III

EVALUATION

	Available at present	End Uses	$ Cost	Years Supply	Environmental Costs/Benefits	Political Costs/Benefits	Social Costs/ Benefits	Total
Weight factor	X_	X_	X_	X_	X_	X_	X_	X_
Fuel								

Discussion should include points such as:

Does it matter how good a fuel seems if it is not available?

Would other groups (nations) have the same priorities? Why or why not?

Are the end-uses equal in importance? Is a source more valuable if it can be used for agriculture or transportation?

How much are we willing to pay - for what?

TABLE II

COMPARISON

Fuel	Available at present	End-Uses	$ Cost	Years Supply	Environmental Costs/Benefits	Political Costs/ Benefits	Social Costs/ Benefits
Ideal	10	10	10	10	10	10	10